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Controlling rare events: optimizing disease extinction with limited vaccine M. KHASIN, M.I. DYKMAN, Michigan State University — In rare events such as switching between stable states or disease extinction the system has to overcome an effective barrier. The barrier height can be changed by applying a control field. The change is determined by the effective work of the field along the most probable trajectory followed in a rare event. In turn, the barrier change results in an exponentially strong change of the event rate. We study the optimal temporal shape of the control field with a constraint that the time- average field value and the sign of the field are fixed. An example is vaccination with a limited vaccine production rate or control by light intensity with a limited laser power. For a comparatively weak field, for a broad class of rare events, optimal control is accomplished by periodically applying δ-like pulses. We show that the barrier change may display resonant dependence on the pulse period and is linear in the pulse area. For a stronger field, the dependence of the barrier change on the field amplitude becomes system-dependent. The results are applied to simple models of population dynamics.

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